Texas Highways

August, 1959 35c

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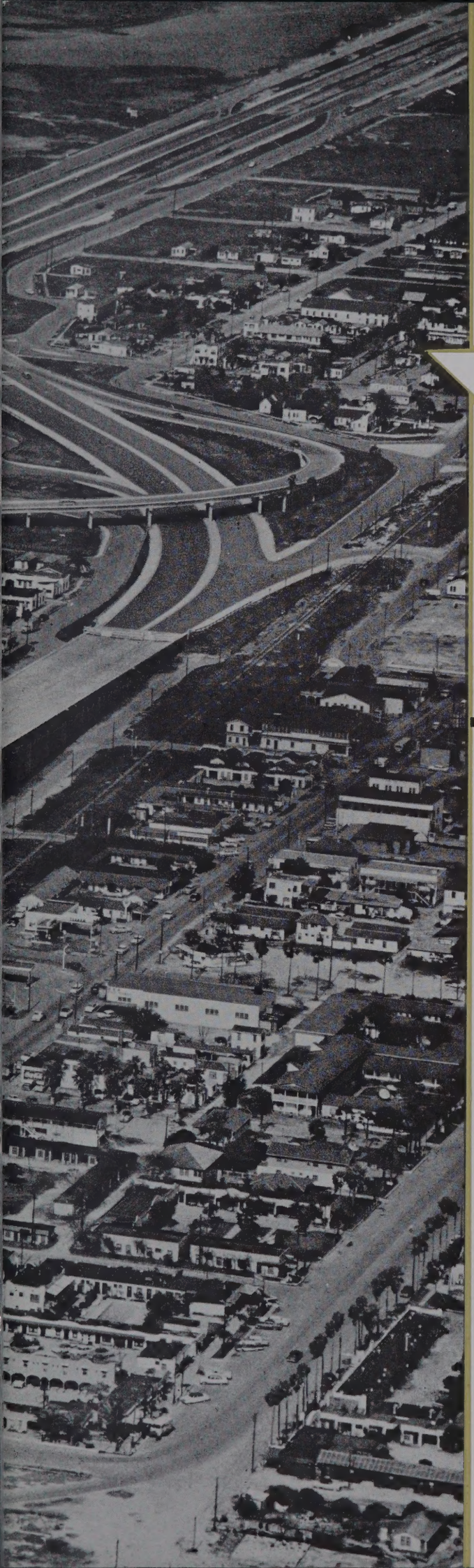

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Volume 6 • Number 8

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Skyway

CORPUS CHRISTI HIGH BRIDGE

B. H. Phillips, Senior Journalist
Information and Statistics Division

A warning siren blares and traffic stops to let an oil barge steam through the lift-span opening on the Bascule Bridge at Corpus Christi. Cars and trucks on this busy section of U. S. Highway 181 halt, stall, and stack up more than 1,000 times a month to accommodate the important ship-channel tonnage of the nation's ninth-ranking port. This hot day in August many a driver looks upward to the steel flanks of the high bridge and longs for the day when his channel crossing can be made on the new more-than-a-mile high-bridge skyway.

After the first of November, 30,000 vehicles a day will roll across the six lanes of concrete and steel suspended 140 feet above the channel. Cantilevered arms support the 400-foot, tied-arch center portion and link the port area of the Gulf-Coast town with its major urban section. Motorists crossing from one part of the city to the other will take to the heights at a 5 per cent grade on the 5,720 feet of bridge roadway.

The high-level bridge over the Corpus Christi Ship Channel was achieved at a cost of $9,053,523 and in a series of five construction contracts. Four lives were lost during the building.

The largest single project of the Texas Highway Department, the structure was designed by the Department's own Bridge Division—headed by Randle B. Alexander. Howard, Needles, Tammen and Bergendoff of Kansas City, Missouri, and New York was the consulting engineering firm employed to double-check the layout and design, and certified that ". . . the structure is of proper structural design and is of adequate strength for its intended loadings."

Richard N. Wakefield of Kansas City, Missouri, was consulting architect for the project.

The high bridge is the result of more than ten years of city-county-state planning—with the first Highway Commission minute order for a replacement of the Bascule Bridge being issued August 23, 1950. The Commission had authorized studies for three types of crossings—tunnel, movable-span, and high-level bridge; and in the 1950 minute action sketched tentative plans for construction of a movable-span bridge—"the

easiest crossing financially," as one engineer put it.

Three transportation factors had to be taken into consideration—highway, rail, and water. One of the reasons the movable-span bridge received the first nod in channel-crossing plans was because rail traffic could not negotiate the grade involved in a tunnel or high-level bridge.

By 1954, the volume of waterborne tonnage using the ship channel, as well as the proposed widening of the channel to care for expanded navigation requirements, dictated the repeal of the 1950 minute order, and new consideration was given to the construction of a six-lane, high-level bridge. (The railroad crossing was relocated four miles west to the city-built Tule Lift Bridge completed this year.)

Before plans were drawn for the high bridge, wind and water currents were carefully measured for many months, and these records used to determine the where and how of the structure. "The high bridge, designed for 110 mile per hour winds, will actually be able to withstand wind velocities well in excess of that figure," say Department studies on the subject.

The high bridge received its first authorization as a project in 1954. Agreements with the port and railway authorities, city and county officials, the United States Corps of Engineers, and local property owners were negotiated; and the first construction contract was awarded in May, 1956, to Cage Brothers of San Antonio. Construction on the $1,386,566 contract began in late June—for the first 1,000 feet of the bridge approaches at each end.

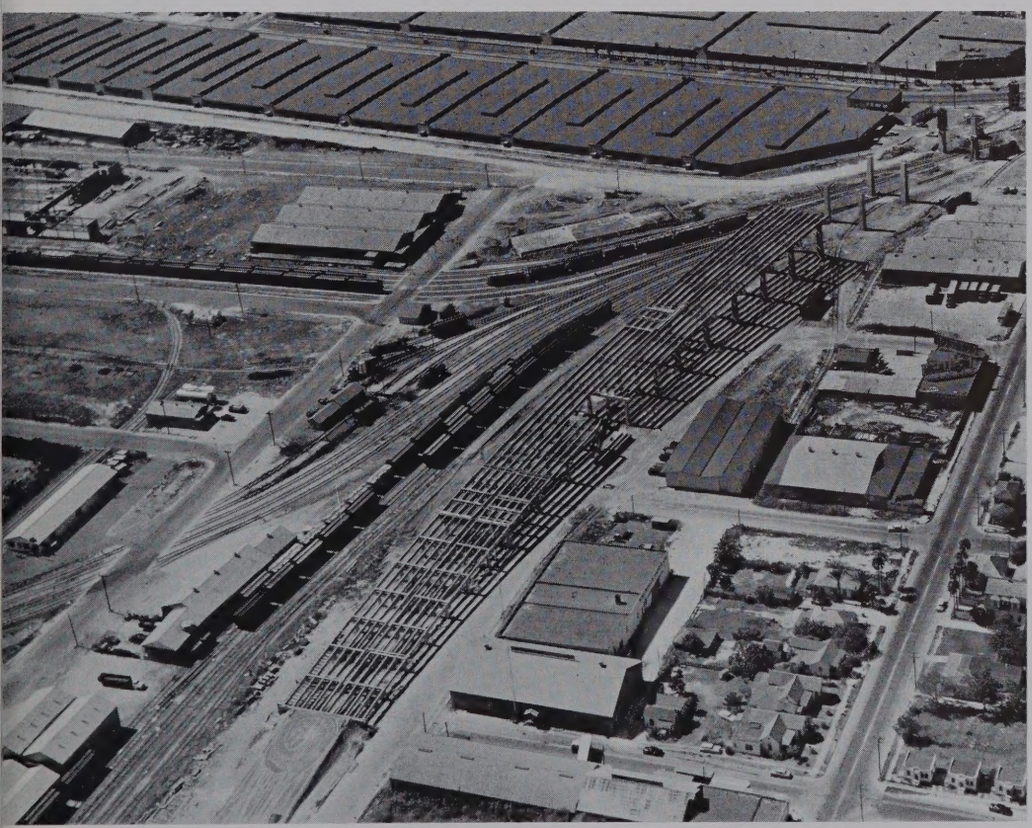
November of 1956 saw the awarding of the second contract for the foundations of the bridge and approaches. The $1,128,637 contract went to the Guy H. James Construction Company of Oklahoma City.

Project engineer Lewis H. White recalls this as one of the most difficult phases of construction. He describes soil conditions of the Corpus area as consisting of a thin layer of firm material on the surface, 30 or 40 feet of soft muck, then a very tough sand and shell bed, below that another clay layer, and then the final layer of sand and shell where the piling tipped out.

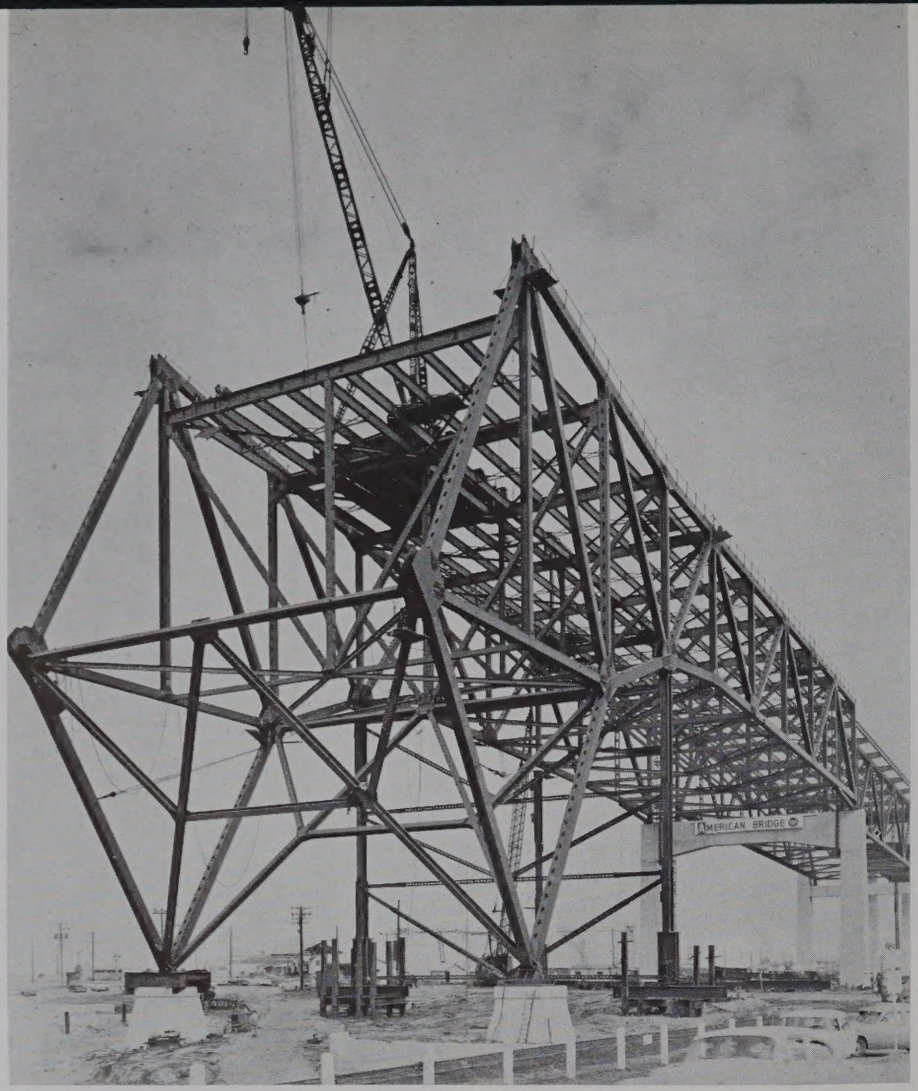
The ground crane hoists steel stringers, the "guts" of a bridge, into place on the concrete bents.

"That first layer of sand and shell was very difficult to penetrate. We had to get below that and into the second sand and shell layer to get stability; and a seventeen-inch-square pile just doesn't drive easily," stated White.

The massive pilings were sunk 70 to 80 feet down into the soil, support and anchorage for the concrete piers which were later to rise from ground level to the 100-foot heights near the



Onward and upward, August 5, 1957, as the lengthening girders outline the south approach.



A 105-ton traveler crane riding on the stringers takes over as work begins on the cantilever truss. The low piers will be fenced off to prevent people from climbing them.

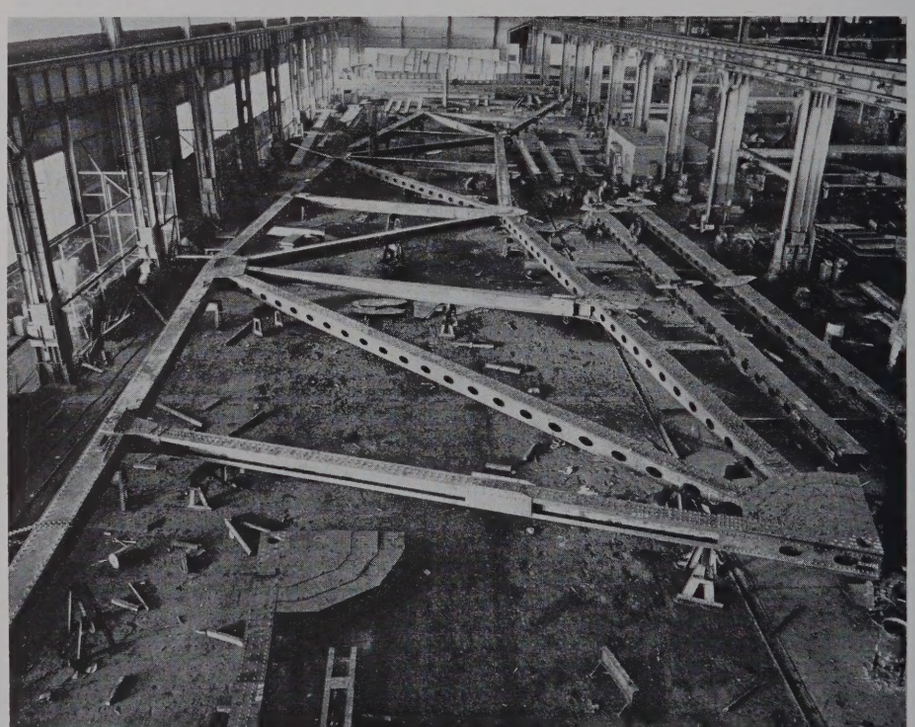
channel. Special excavation was needed for the planting of the foundations for four ten-foot-square concrete piers at channel bank. Water was temporarily "fenced off" to allow this operation. These ten-by-ten piers support the giant shoes of the steel V's which bear the stress of the cantilever over the water.

The third contract, for $3,502,482, was awarded United States Steel in December, 1956. American Bridge Division of U. S. Steel got its portion under way initially in Birmingham, Alabama—fabricating the thousands of parts for the central steel of the high bridge according to Department drawings and specifications.

Closely following the assigning of the steel work, a fourth contract was awarded in January, 1957, to J. A. Raines, Contractor—a Muskogee, Oklahoma, firm. This $2,040,100 agreement was for the superstructure and 1,000 feet of concrete roadway at each end of the steel portion of the bridge. The fifth and final construction contract, $172,688 for railing, was awarded the same company in March, 1959.

To give a feeling of security to hikers hardy enough to foot it across the High Bridge, the steel railing will be four inches higher than the usual protection. Rising 40 inches from the top of the curb, the top rail will strike most pedestrians about hip level—rather than just above the knee.

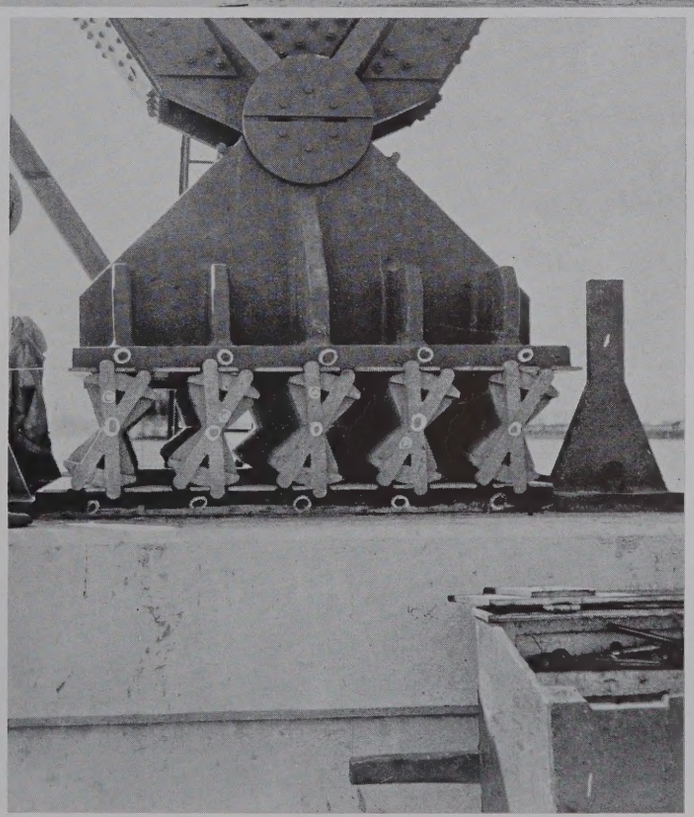
When asked about the motorist's lateral view from the bridge—with the Ship Channel flanked by industrial plants on the west, and Corpus Christi Bay and Mustang Island on the east—Engineer White said the height of the car would determine the passenger's sight-seeing ability. "Some of these cars are so low, eye-level will probably hit about rail-level. Maybe they'll be lucky, though, and see through the spaces between rails."



Each individual truss was fitted together at United States Steel's American Bridge Division plant in Birmingham prior to disassembly and shipment to the bridge site. This process insures that all parts will fit.

Two big traveler cranes muscle the steel into place. The suspended tied arch will be directly above the ship channel.

The driver approaching the bridge via either the south or north interchange is soon aboard the roadway over the 40-foot prestressed concrete beam spans. The span length is upped to 60 feet as the bridge grows higher, and then come the 90-foot and 150-foot welded steel girder spans which give the required clearances for the multitrack connections to the railroad yard and for the undercrossing at Port Avenue.



All movement in the bridge is taken at the south end. These rocker shoes take care of the temperature variations which could cause a four-inch movement in each direction. Wind movement is slight, hardly measurable.

Motor traffic will soon roll along the newest addition to the Corpus Christi skyline—the Corpus Christi high-level bridge. The old U. S. 181 crossing will be removed to make way for widening the port entrance.

Once on the bridge, he will travel on a three-lane, 36-foot concrete roadway—his opposite number heading the other way on one of the three lanes allotted to that purpose. The two traffic currents are divided by a four-foot median strip, and outlined by a three-foot emergency sidewalk on each side. The total deck area is just about eleven acres — 476,994 square feet.

Lighting for the bridge comes under a $96,424 two-contract project awarded in May, 1959, to the Philips Electric Company of Houston. This project also includes lengths of expressway illumination on State Highway 9 and U. S. Highway 181.

Special lighting has been provided for certain areas of the bridge proper. Three red lights riding on the 243-foot-high crown of the main truss arch will beam a nighttime warning to aircraft traveling overhead, and six navigation lights (red and green) clamped beneath the bridge will post notice of low steel for ships sailing the channel.

Transportation studies indicate that highways and waterways will carry an increasing burden of traffic. If the up-trend continues as predicted, the high bridge will see great activity along its own roadway and on the channel below. Congress has authorized the deepening of the Port Aransas-Corpus Christi Waterway, and completion of highway and rail crossings now under way will make possible the removal of the present bottleneck entrance to the port. The old (1926) Bascule Bridge will probably be removed during the next year. Railroad traffic will be switched to the Tule Lake Lift Bridge; motor traffic to the Corpus Christi high bridge; and the port entrance channel widened from the present 94 feet to 400 feet.

The channel is spanned! The first crossing, a dizzy walk along a single beam, was made March 13, 1959, by a steel worker foreman. The Bascule Bridge appears midget-size under the block-wide, high-level structure.

Painting and Beading

In District 23

Adrian C. Pluckhahn, Sign Supervisor
District 23

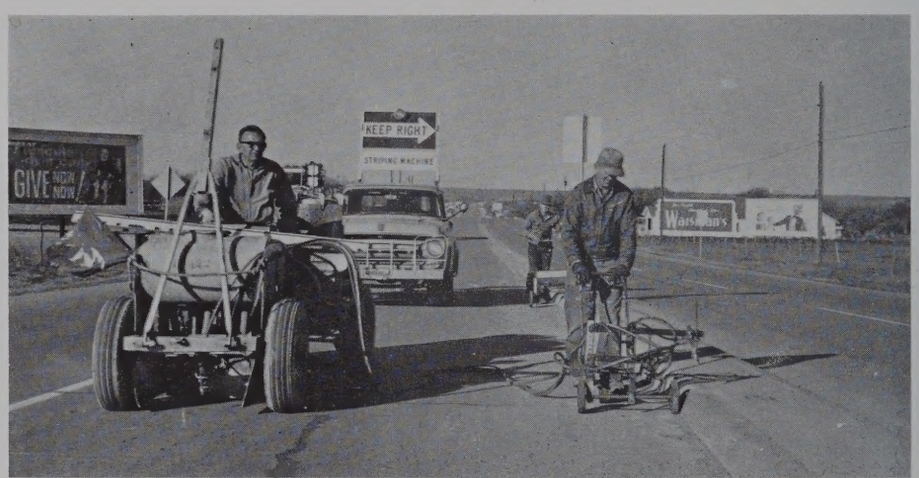
With the ever-increasing number of channelized intersections and median strips, we were in need of a fast, efficient way of painting and beading curbs.

To meet this need, we devised a small three-wheeled cart with just enough framework on it to mount three paint guns used on our old striping machine. The two or three guns, as preferred, are fed with one fluid line and two air lines. The fluid and air are furnished by the old striper. The left front wheel is driven snug against the curb for good alignment; the single rear wheel is offset to the right to allow painting of flat surfaces as well as curbs. We use 25 feet of hose, enabling the operator to paint around a very short radius.

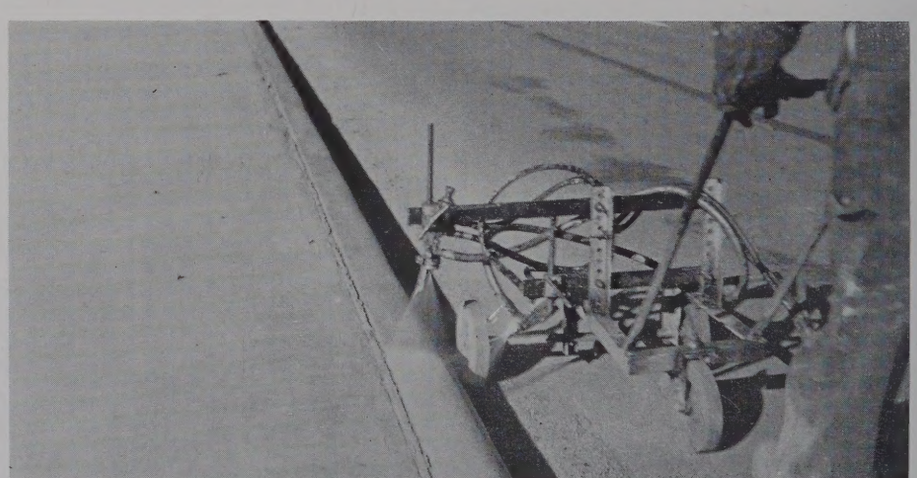
The bead dispenser was built from our old bead machine taken from the Sign Shop. It is 24 feet long with a single row of holes one-eighth inch in diameter, one-eighth inch apart. The wheels are mounted on angle iron slotted so that each wheel can be raised and lowered individually, keeping the box level at all times.

Both machines operate as fast as a man can walk. They are very inexpensive and have proven to work very well.

The paint unit could be used on any type of machine able to supply two or three guns with air and fluid.



The old striping machine serves as paint and air supplier.



The three-wheeled paint unit has spray guns arranged to apply paint on the vertical and horizontal surfaces.

These devices provide uniform application of paint and beads.

A retired sign-bead dispenser is mounted on this cart, equipped with adjustable wheels.

In District 7

R. N. Jennings, District Maintenance Engineer
District 7

Personnel of District 7 responsible for placing center stripe have devised a method for painting and beading medians and curbs which is both effective and economical.

The painting is done with a conventional paint gun working off the center-striping machine. Beading is done by means of a nozzle using beads from the regular container on the machine.

We have found that diluting standard center-stripe paint with kerosene gives a better job when medians and curbs are being painted. Kerosene delays the drying time of the paint and permits better retention of beads, and the thinned paint penetrates and adheres to new concrete better than undiluted paint.

Paint, applied by a conventional paint gun, has been diluted to better adhere to new concrete.

Beads, from the regular container on the center-striping machine, are sprayed through a nozzle. The thinned paint permits better retention of beads, also.

A New Tool for Rehabilitation of Bituminous Surfaces

heater-planer

An overlay may not necessarily be the best remedy in the rehabilitation of cracked and rough bituminous pavements.

Under certain conditions the use of the heater-planer appears to have considerable merit for such work.

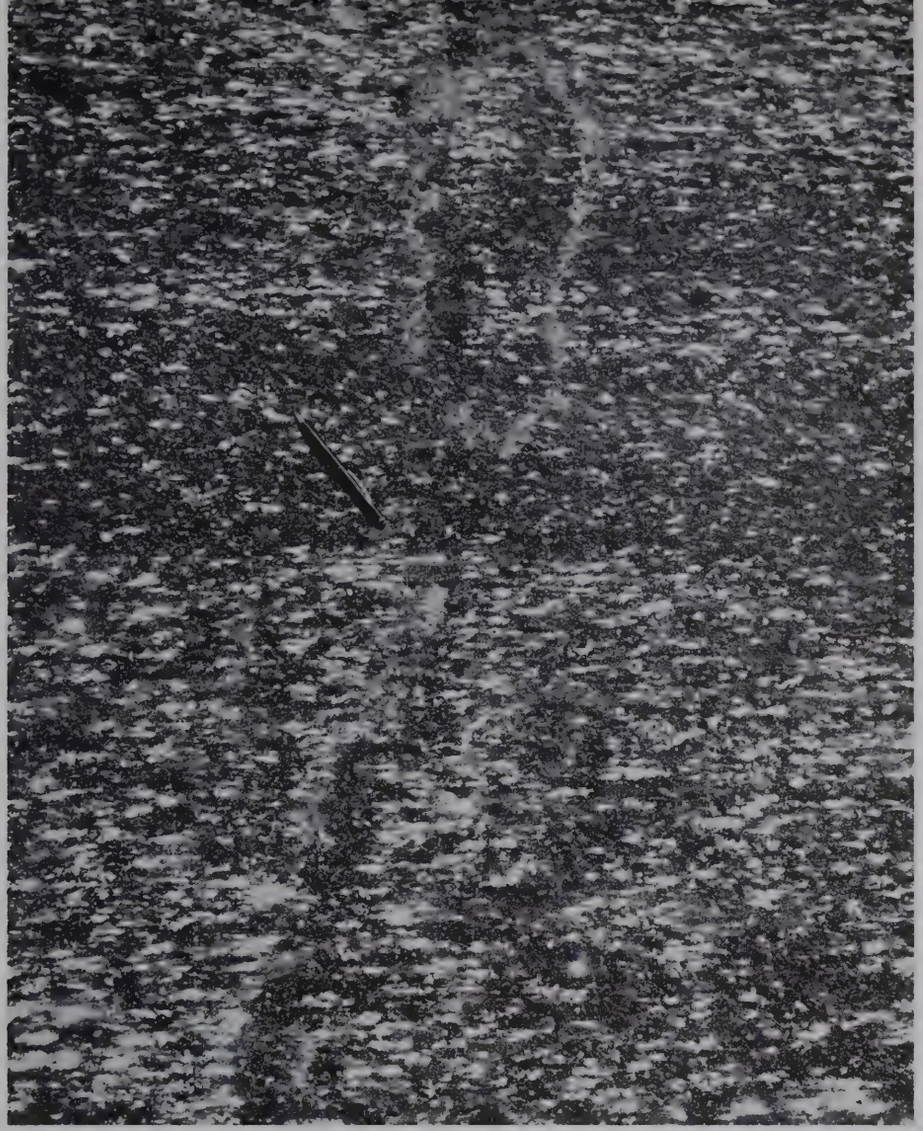
This was the finding of Highway Department engineers as the result of an experiment conducted at Borger.

They learned, in fact, that the heater-planer can be useful not only in eliminating corrugations but in preparing for resurfacing or sealing, restoring good traction to streets or highways which have become slick, and in restoring proper drainage and curb heights where excessive leveling has been placed in gutters.

What is the heater-planer? It is a mildly elaborate monster which uses as its base a Caterpillar D-12 motor grader. Briefly, the chain of modifications to the grader is as outlined below.

Weight is added to the front of the grader for more traction and smoother planing. Steel wheels are substituted for the rubber front ones. A furnace for heating the asphaltic road surface is installed near the front,

The picture shows an area where the asphalt surfacing has broken down and cracked, creating bumps or corrugations in the pavement.



After an area has been planed, the exposed asphalt is more alive than the old surface. This creates a better bond between the planed surface and the new course, if one is to be laid, or it makes for faster and stronger sealing under traffic if no new course is to be applied.

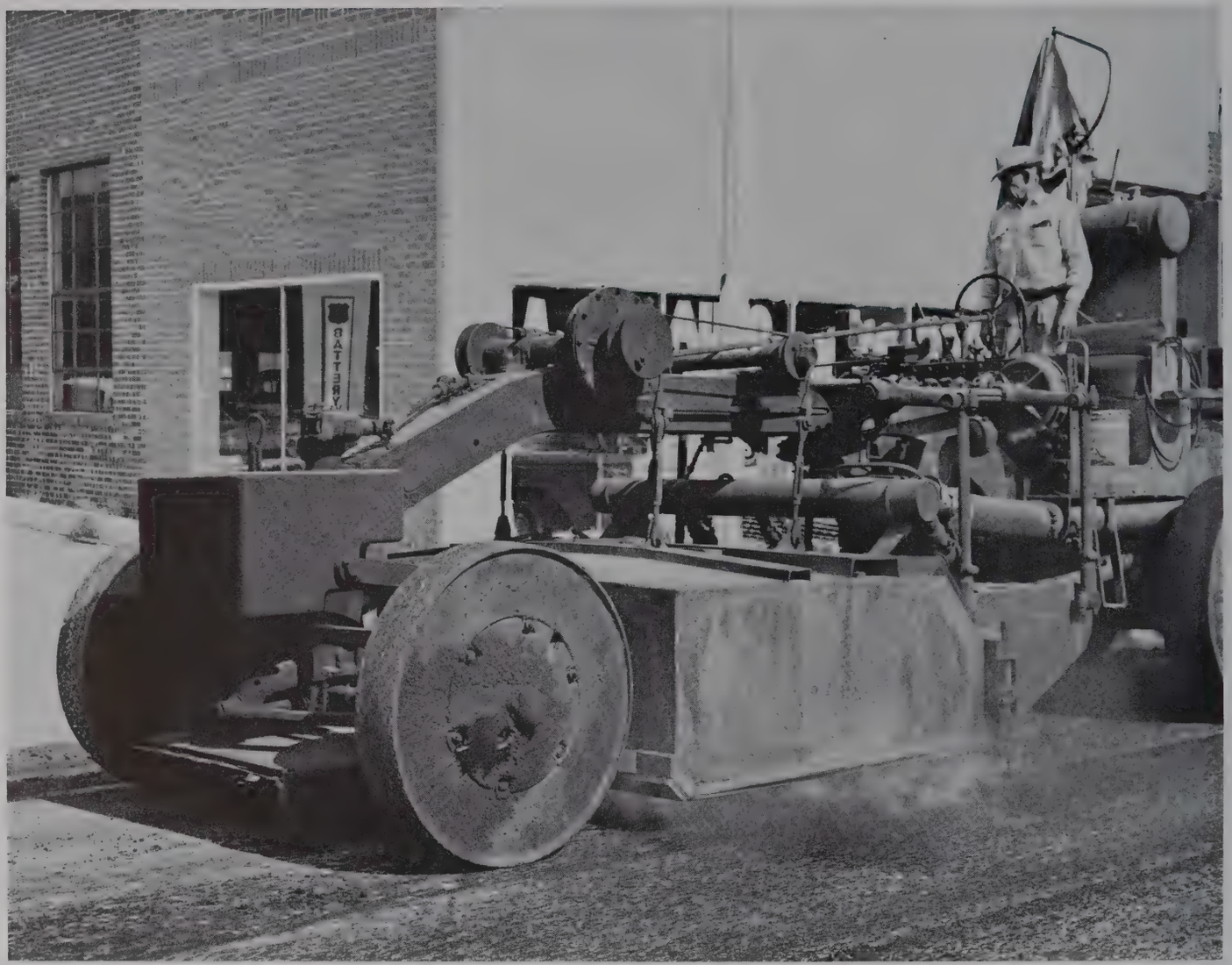
iary motor mounted on the back of the unit. The gross weight of the unit is 42,000 pounds.

As the machine moves along, usually at 25 to 30 feet per minute, the temperature in the furnace is around 2200 degrees Fahrenheit. The five oil burners, firing down through the furnace box, heat the asphalt surface to a temperature of between 180 and 240 degrees, depending upon the type of surface being planed. Three-way control of the heat—micrometer fuel and butterfly air valves, adjustable positioning of the furnace, and the forward speed of the machine—provides the proper temperature on pavement.

Following the furnace, the blades, which are wider than the wheel base just behind the front wheels. Two self-sharpening, highly tempered, steel cutting blades are installed in a "V" shape just behind the furnace box. These blades take an eight-foot-wide swath with the apex of the "V" pointing toward the back of the machine. The back wheels are rubber with no tread. This prevents marring of the asphalt.

The elevator, which picks up the cuttings, is driven by an electric motor with a zero-load circuit breaker. If the elevator strikes a heavy object in the road or encounters too much resistance of any kind, the motor cuts off, preventing any damage to the belt and drive system. The generator, which furnishes the power for the electric motor, is driven by an auxil-

This shows a planed surface after traffic has been allowed to run over it for a period of time. Note how it has sealed. This occurred because there was sufficient bitumen left in the planed surface.



In this picture the furnace is shown in a side view while the machine planes near the curb. Note the blade protruding just behind the furnace.

of the machine, plane off the heated pavement surface. After the planed-off material or residue has been windrowed back through the V-shaped blades, it is picked up by the elevators and carried up into a truck which is attached to the heater-planer unit.

Perhaps the uses of the planer can be explained in a simpler fashion if its limitations are first enumerated. They are as follows:

1. Some surfaces cannot be planed effectively.
   - A. It is not practical to attempt to plane any asphaltic surface of less than about one-half inch in thickness, such as a penetration surface course; and there must be good bond between the surface and underlying base.
   - B. Where the aggregate is very coarse, as in the old-style macadam process, planing will often result in tear-up.
   - C. Planing cannot correct faults due to base failures.
   - D. Difficulty may be encountered if aggregate is extremely hard.
2. The job must be a relatively large operation before planing will be justified.

Therefore, the unit can be thought of as nothing more than a special-purpose piece of equipment to be used on jobs of a very special nature. When it is considered in this light, the planer is seen as an inexpensive, efficient piece of equipment.

In cases where the highways or streets have become slick or have developed corrugations, planing has proven most effective. Often it is not necessary to resurface these jobs, provided the material is rich enough in bitumen to reseal under traffic.

Highway Department engineers on the scene in Borger report that planing is expected to give a longer lasting job than leveling because it elim-

This picture, which was taken from in front of the blades, shows the furnace, the blades, and some of the burners.

inates "after" compaction which will cause a "reflection" of any defects in the old surface.

When planing in preparation for the resurfacing of a highway or street, the function of the planer is two-fold: (1) to remove the oxidized crust from the surface, creating a better bond between the old and new materials; (2) provide a smoother surface that will require little or no level-up for a good riding surface.

The machine will make a maximum cut of three-fourths of an inch, but contractors seldom make a cut this deep. To do this the machine would have to move too slowly in order to heat the asphalt to a sufficient depth. Usually, the cut will be from one-eighth to one-fourth of an inch on each pass, repeated until satisfactory surface is obtained.

On the Borger job, one-eighth-inch cuts were made on each of two passes over the road proper and three passes over the gutters. After the planing, there was an average of about three-fourths of an inch of surfacing left on the street. The gutters were cut down to base in order to provide proper drainage.

If the job is a sizable one, planning may be more economical than any other method of repairing a street or highway. It often eliminates the necessity of an overlay or a complete reconstruction of a surface.

The cuttings may be used again for resurfacing old pavements, for base widening, maintenance work, or any other use which calls for a premix. The addition of a flux may be needed, depending upon the condition of the material.

The cost of the Borger job was about 13 cents per square yard for the planing operation. This figure covers the cost of the machine and

David Campbell of District 4, left, and C. T. Reese level the asphalt over the truck bed.

Above is an oblique view of the unit, including the truck. Note that the blades are wider than the wheel base of the planer and the truck. This enables the unit to plane flush with curbs and walls.

the operator. It was estimated that this was approximately 20 per cent under the cost of leveling the same job. Making the one-eighth-inch cuts, it took the machine about 30 minutes to fill the truck with four cubic yards of cuttings. After the planing operation, a new surface of 125 pounds per square yard of type "C" hot mix asphaltic concrete was placed.

An added value connected with planing is the fact that seldom is there any problem concerning traffic while planing is in progress, since vehicles may drive right over the planed surface. Indeed, this promotes faster sealing of the surface.

Planing, just as most other operations, has its disadvantages, too. For instance, if heat is not controlled, the asphalt left on the roadbed could be damaged. Nonuniformity of the existing pavement thickness could result in exposing the base to the extent that it would render the planing operation unjustified.

In spite of these disadvantages and the limitations which were outlined earlier, the heater-planer does offer the highway engineer another useful tool. It doesn't take much reflection to visualize many jobs on highways, particularly in urban areas, which can economically and efficiently use the special service offered by the unit. Further reports from Borger will probably influence the decision of Departmental officials on the future of the unit in Texas.

Caps for Metal Signposts

Submitted by Archie J. Sherrod, District Engineer
District 6

Through the years, we have followed standard procedure and used two-inch pipe caps for metal signposts. These caps cost approximately 50 cents each, and the cost of threading two-inch pipe and installing the cap is about 50 cents. Pipe is purchased in 21-inch joints which are threaded at each end, but it is still necessary to thread some pipe in the field.

During the last few years, the number of metal signposts has increased rapidly, and an investigation was made to find some substitute for the expensive pipe caps. Several different types of plugs and caps were tried, but a freeze plug normally used in large engines was found to be the most economical and efficient. A few blows with a light hammer will insert the plug tightly in the pipe, and it is not necessary to ream the pipe. The freeze plug is treated with a noncorrosive material and should last indefinitely. When the freeze plug is used, the signpost is cut off approximately two inches above the top sign clamp. The post does not extend above the top of the sign.

In quantities of 5,000, the cost of the freeze plugs are less than 4½ cents each, and the cost of installation is negligible. We are now using the freeze plug on replacements and new installations. With a saving of from 45 to 95 cents per post, it appears to be very satisfactory.

Freeze plugs used to cap metal signposts result in a saving of from 45 to 95 cents per signpost.

The freeze plug, treated with a noncorrosive material, is easily inserted, and lasts indefinitely.

A Safety Program Begins

First Preconstruction Conference

Last April, TEXAS HIGHWAYS reported on the progress of committees formed to study the problem of handling traffic safely and conveniently through construction areas—committees composed of representatives of the Texas Highway Department, Associated General Contractors, the Texas Department of Public Safety, and the Director of the Governor's Highway Safety Commission.

The gravity of the problem became apparent upon examination of the safety records for 1958: In highway and bridge construction areas there were 1,545 accidents with 70 resulting deaths. Of the total number of contracts awarded during 1958 (760), this averages two accidents per contract and one death in each eleven contracts.

One idea which developed as a result of the study was the initiation of a preconstruction conference on all construction projects. Instructions for these preconstruction conferences and information concerning them were discussed in Administrative Order No. 32-59, June 16, 1959. The Department of Public Safety issued similar information to its organization at the same time.

TEXAS HIGHWAYS was invited to observe one of the first preconstruction conferences held under this new plan. The conference was held in Taylor on June 30, with all parties concerned with the construction project for resurfacing State Highway 95 attending. Moderator in charge of the first conference was Frank P. Faris, Senior Resident Engineer, District 14, in charge of all highway work in Williamson County.

Faris welcomed representatives of the three organizations plus the contractor for the new construction project, local police officers, and members of the press and radio media in the Taylor area. Also on hand to observe the first conference were Ed Bluestein, District Engineer, District 14;

J. P. Allen, General Superintendent of Giesen and Latson Construction Company, explains the type construction to be used in the project. Seated at the presiding table are Carl A. Grau, Senior Resident Engineer in Taylor; Frank P. Faris, Senior Resident Engineer for Williamson County; and Noble Latson, of Giesen and Latson.

Inspecting the construction site and discussing safety measures to be used are Contractor Latson; Sgt. Marvin Holubec, Taylor Police Department; Emmitt W. Mahlmann, Senior Party Chief; Sgt. F. E. Boyd and Patrolman Travis Thomas, Texas Department of Public Safety; Faris; and Contractors E. W. Giesen and Bob Giesen.

Ed Bluestein, District Engineer, District 14, explains to the group his feelings on the importance of increased safety through construction sites. Sitting immediately to the left of Bluestein are Tom H. Taylor, Manager, Information and Statistics Division; E. Wayne Hall, Associated General Contractors; and Brad H. Smith, Director of the Governor's Highway Safety Commission.

Tom H. Taylor, Information and Statistics Division, chairman of the Public Safety Education Subcommittee; E. Wayne Hall, Safety Director of Texas Highway-Heavy Branch, Associated General Contractors, committee member; and Brad H. Smith, Director, Governor's Highway Safety Commission.

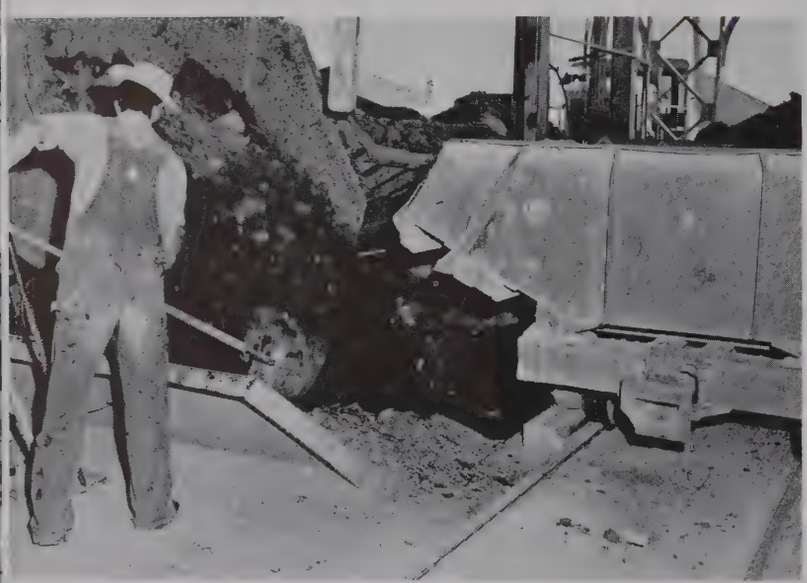
During the conference, the contractors, Giesen and Latson Construction Company of Austin, discussed the new project on State Highway 95 from the city limits of Taylor north to Granger. Highway patrolmen and Taylor police officers explained the speed-zoning restrictions planned for the area and methods to be used for minimizing inconveniences to motorists. Press and radio representatives received press releases which were to forward the information to citizens in the Taylor-Granger area.

At the conclusion of the conference, Brad H. Smith offered an appraisal of the pilot meeting. "The preconstruction conference, as we have seen it carried out here, will be our greatest tool for erasing the useless waste of human life and property in highway construction areas."

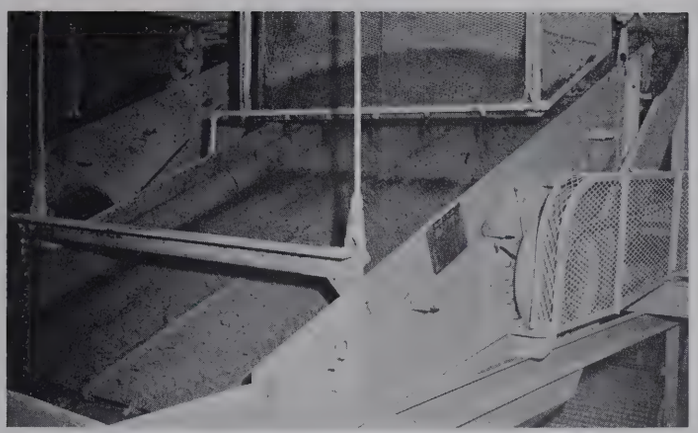
Bluestein commented that "only through the close cooperation of all three agencies—the Highway Department, the Highway Patrol, and the contractor—can we hope to markedly reduce traffic hazards in construction areas. I hope every District will use this preconstruction conference to its greatest advantage in protecting the lives and property of the traveling public and the highway workmen while at the same time directing traffic safely and conveniently through the construction area. This program is off to a fine start."

Quarried cement rock, blended with shale, is the major raw material at this plant. Some Texas plants use oyster shell from the Gulf of Mexico instead of rock. Clay and shale, and at times small quantities of iron ore and sand, are added to the raw rock to provide the proper chemical composition.

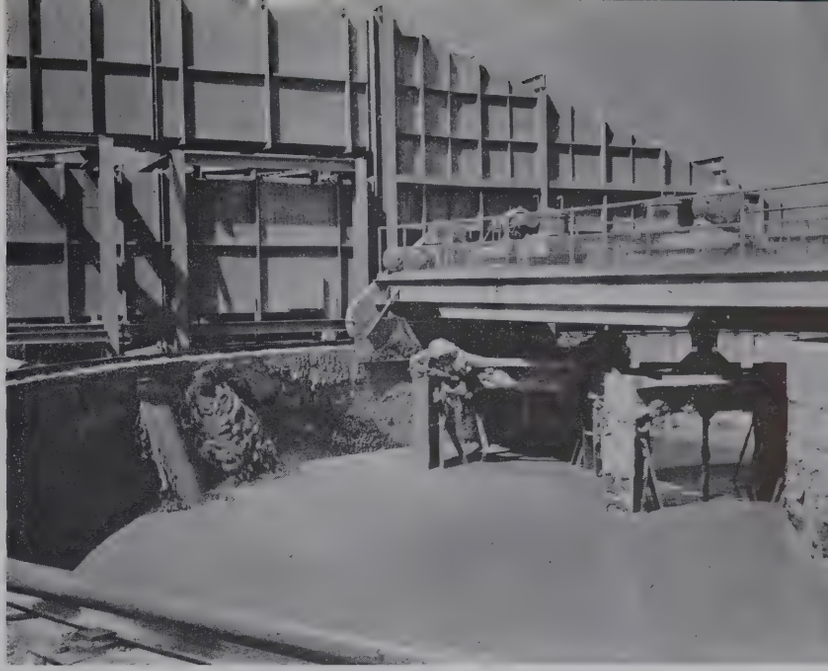
That Remarkable Gray Powder - CEMENT



Initial blending of the cement rock and shale begins at the hammer-type crusher which mixes, blends, and crushes the material into small pieces.



From the first compartment, the mixture is passed through a vibrating screen where the oversize particles are separated and returned for regrinding. The acceptable particles are taken to the second compartment for final grinding.



From the raw grinding mills, the entire mixture, now called slurry, flows into mixing, blending, and kiln-feed basins where it is agitated mechanically and with compressed air.

Portland cement—that fine, gray dust which went into making over two million cubic yards of Highway Department concrete in 1958—is an indispensable partner in the highway-building process.

For the information of the uninitiated, portland cement is a type of cement, and not a brand. It came to be called "portland" because in the early days the finished concrete resembled a gray stone at one time quarried on the Isle of Portland off the British coast.

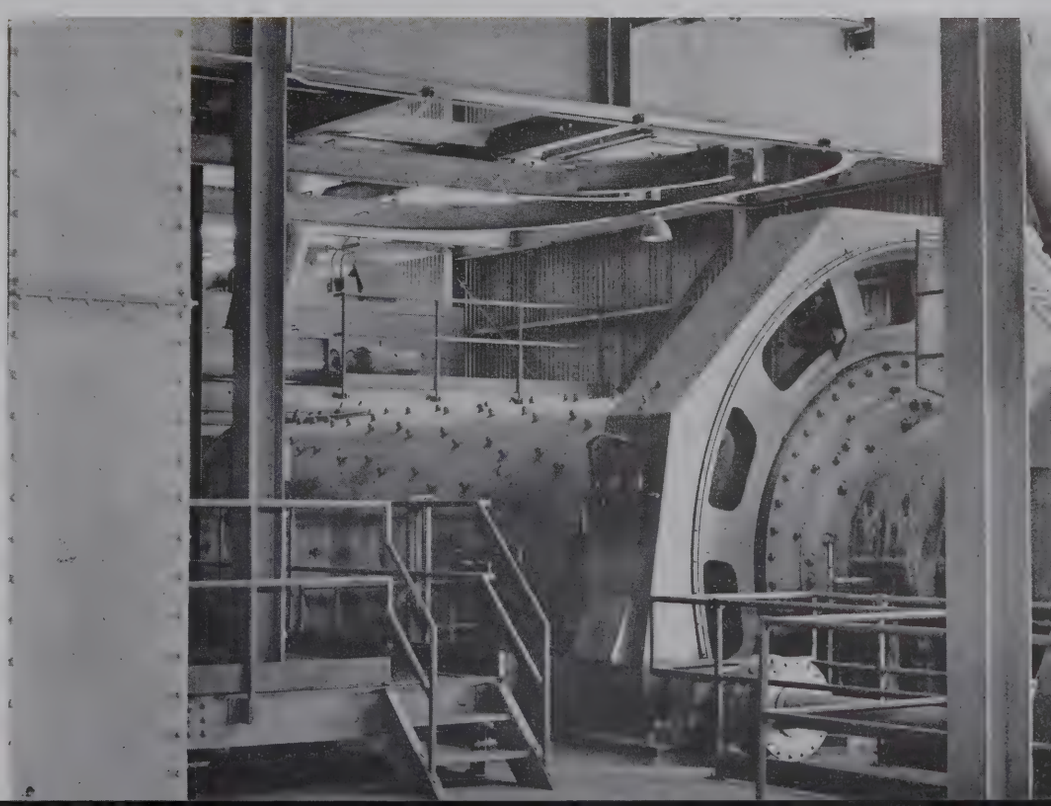
Another point often misunderstood by the layman is that the term "cement" applies only to the gray powder which brings about the binding of aggregates. For instance, a concrete sidewalk should not be referred to as a cement sidewalk.

A camera tour through one of the fourteen cement plants in Texas tells a story of machines operated by scientific know-how which transforms cement rock, shale, and sand into one of man's most versatile building materials.

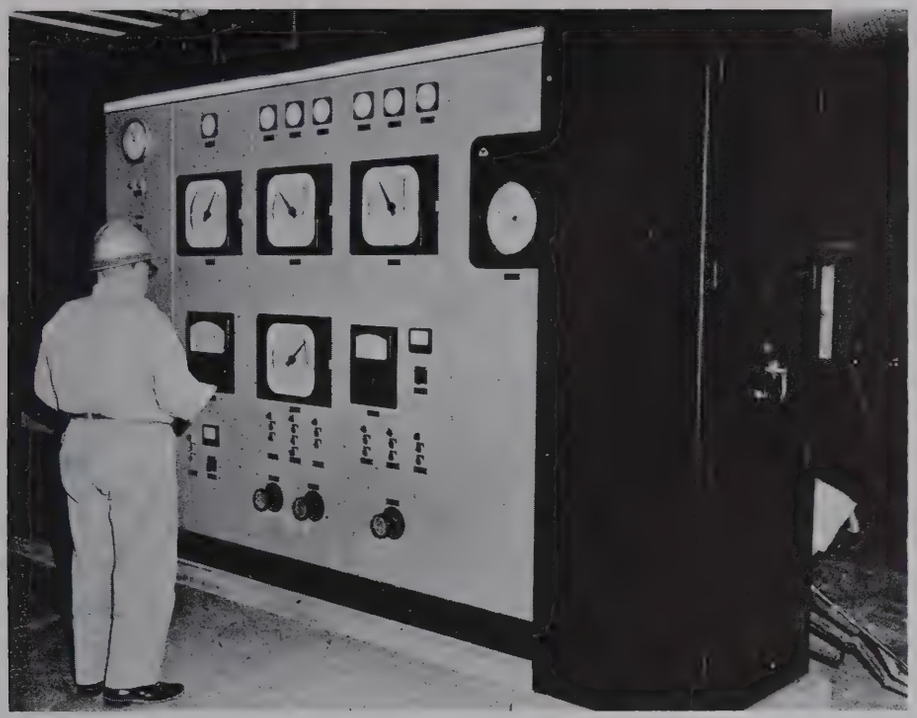
The first mill operation begins as the raw materials and a small, controlled amount of sand are fed into grinding mills. The mill is divided into two compartments, each partially filled with steel balls of from one to four inches in diameter. As the mill rotates at high speed, the raw materials are ground together with water in the first compartment.

»

« ***The mixed material travels by conveyor belt to rock storage bins.***



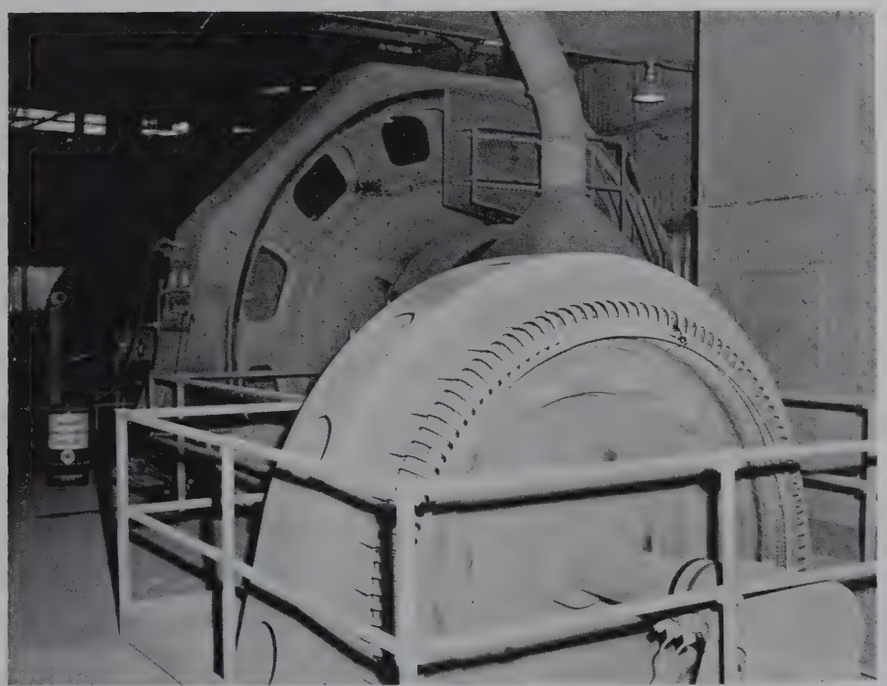
The slurry, now completely mixed and blended, is fed into the rotary kilns—each 275 feet long and wide enough for a small truck to pass through. In the kiln, temperatures that would melt steel bring the mass of raw materials to the point of incipient fusion, forming an extremely hard material known as portland cement clinker.



Controls for the draft and other operations of the massive kiln are centered on this panel. The kiln rotates at 75 revolutions per hour, achieving a temperature of 2700 degrees F. During 24 hours' operation, the entire plant consumes 14 million cubic feet of natural gas; 160,000 K.W.H. of electricity; and 400 pounds of lubricants.

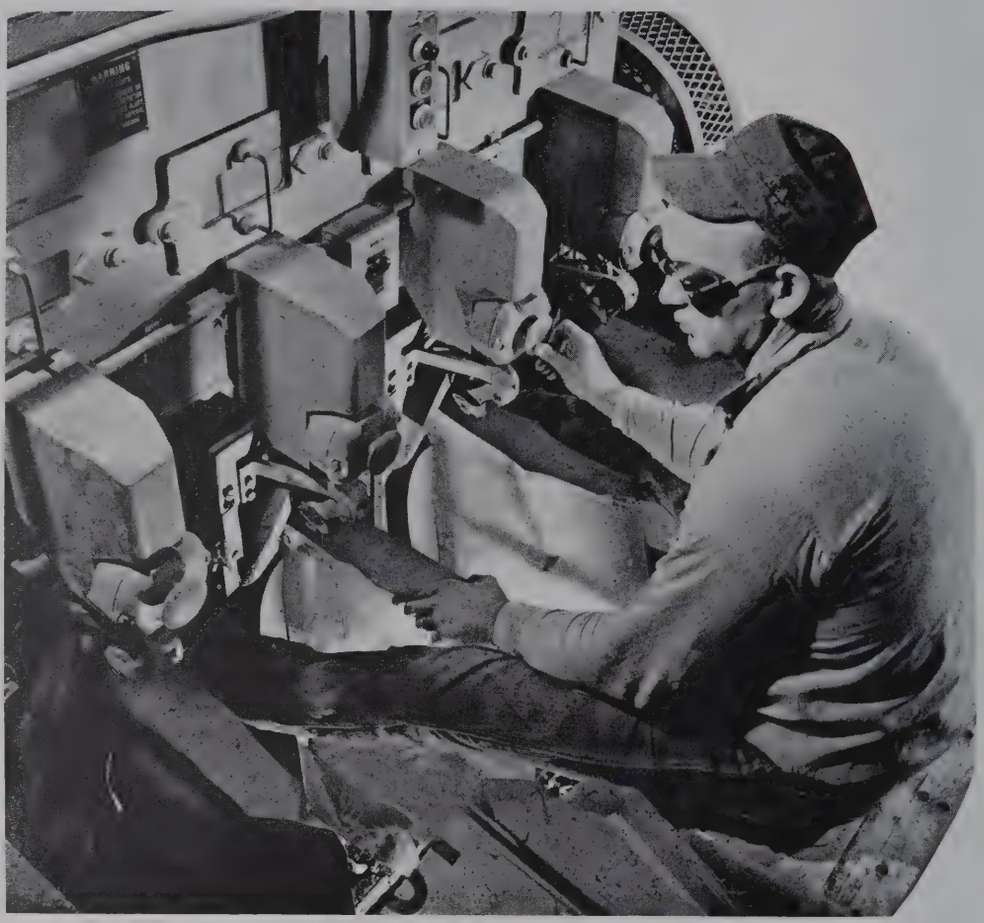
Below the kiln, the cement clinker falls onto a series of step-down, oscillating cooling plates. Cold air, which is passed through the plates, cools the clinker, furnishing in turn preheated air for the kiln.

Controls for the final stages of grinding the clinker into cement are located on this panel.



The cement clinker, now a black pellet hard enough to scratch glass, is fed with gypsum into the finish mill, again to be ground between thousands of steel balls in high-speed rotary kilns. The cement is ground so fine that it will pass through a sieve that will not pass water.

From storage silos, the cement is bulk-loaded into waiting trucks and railroad cars or passed to a packing machine for shipment in bags. In 1958 Texas plants shipped more than 25 million barrels of cement.



Throughout the cement manufacturing process, careful control is kept by constant chemical analysis —insuring that product quality remains constant and contract specifications are fully complied with.

The Patriarch of Roads

The oldest road in the world spanned a distance of 1,755 miles across Southwest Asia, Asia Minor, and connected the Persian Gulf with the Mediterranean Sea. History first recognized this ancient road as a vital route around 4500 B.C., but even before that it was constantly used as a trail by man and beast alike.

The Persians called it the Royal Road after their conquest of Mesopotamia. Throughout the ages kingdoms and powers along the Royal Road have soared to their zenith and glory and then plunged into oblivion. National boundaries have been shifted, and a heavy stream of people have trodden its course; but the route of this great thoroughfare remains undisturbed through the aeons of time.

Over its beaten surface men first tried, developed, and perfected many inventions which made the advanced civilization of today possible. The wheel and axle, the domestication of the horse, the arch for the bridge, and possibly the first pavement were only a few of the successful ideas tried and developed on the Royal Road. Silver money seems to have originated in Asia. The Royal Road created the necessity for a common medium of exchange since its travelers spoke many tongues and were from many countries. As a result of this necessity, silver coins were introduced and first used by travelers of the Royal Road.

The ancient king of Assyria (705-681 B.C.) solved the controlled-access problem and that of commercial establishments interferring with traffic by issuing a decree stipulating that "any person whose property encroached upon the 78-foot width of the main street along which passed the Royal Road in the capital city should be put to death and placed upon a pole in front of his house."

Undoubtedly the Royal Road was very instrumental in helping spread the word to the rest of the world of the coming of the Messiah in Palestine. The Bible clearly indicates that many great characters in both the Old and New Testaments traveled the Royal Road since some of the towns visited were served and connected by this route. From Abraham to the Apostle Paul, the Bible, in recording history of the Israelites, mentioned cities and kingdoms served by the Royal Road. The route began at Susa where the tomb of the Prophet Daniel is located and the termini were at Smyrna and Ephesus—the latter the city where Saint Paul encountered the populace in the worship of their infamous Goddess Diana.

History tells us that to travel the Royal Road from end to end required three months and three days, an average speed of about nineteen miles per day. This ancient road for thousands of years was the most important link in the development of the Old World. It was more than just a travel way; it was way of life.

Never in ancient or modern history has a road served so many so long.

Meet the Equipment Supervisors

The equipment supervisor of any District in the Texas Highway Department, an individual in his own right, shares at least one noticeable personality trait with those who have his job in the 24 other Districts. He is a settled type of man. On the average his years of service with the Department are more than 25.

Only five equipment supervisors in the entire highway setup have been with the Department less than 20 years. The freshman of the lot—James E. Greenwalt of District 21—will soon celebrate a seventh anniversary with his District. The dean, with 38 years to his credit, is T. A. McBride of District 10. Joseph S. (Bill) Gaines, a 34-year man, is seniority champ of all employees in District 4. No doubt about it, in the Texas Highway Department the equipment supervisor is a permanent employee. What of the time he spends away from the shops?

There are fishermen among the 25. Some are gardeners.

Not uncommonly, an equipment supervisor is known for his mechanical ingenuity, as is J. C. McMeans of District 16. "Mac" improvises the special equipment needed to do highway maintenance jobs in his District. George D. Fisher of District 22, who also is inventive, pioneered in the construction of various models of center-stripe equipment. And, Jimmy N. Maloney of District 2, from an off-job study of electronics, set up the traffic-signal maintenance section in his District.

With the 25 equipment supervisors rests first responsibility for the nearly 11,000 pieces of major equipment owned by the Department. Their inventory of tires alone will count up to nearly 75,000. It is logical that D-4 began its energetic preventive maintenance program through the dependable hands of these men who have a practical view of equipment costs in their bailiwick. Meet them.

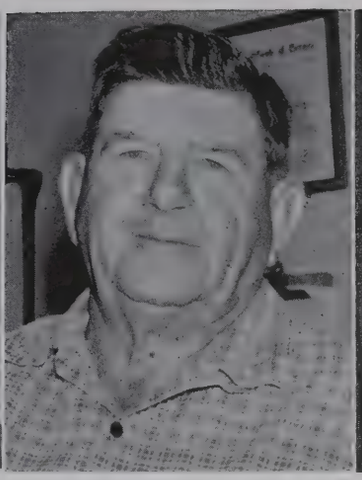
Lontie F. Hinkson
Senior Equipment Supervisor
Paris, District 1
Service: 27 years

Jimmie N. Maloney
Senior Equipment Supervisor
Fort Worth, District 2
Service: 24 years

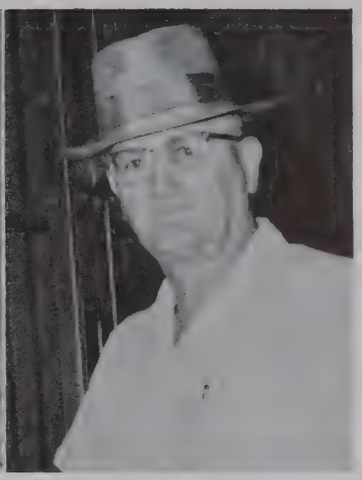
Leambus L. Lindsey
Senior Equipment Supervisor
Wichita Falls, District 3
Service: 34 years

Joseph S. (Bill) Gaines
Senior Equipment Supervisor
Amarillo, District 4
Service: 34 years

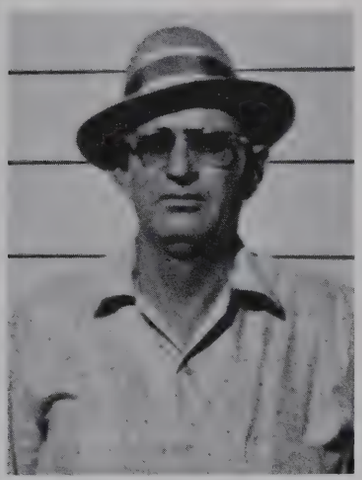
Onza R. Justiss
Senior Equipment Supervisor
Lubbock, District 5
Service: 24 years



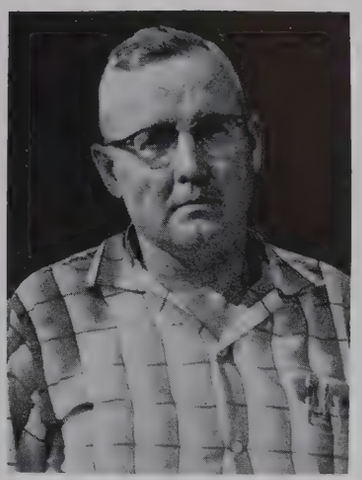
Virgil M. Campbell
Senior Equipment Supervisor
Pecos, District 6
Service: 31 years



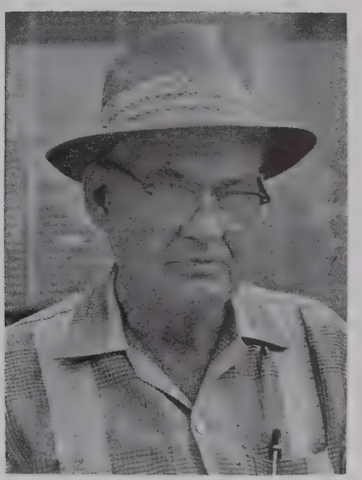
Walter A. Vannoy
Senior Equipment Supervisor
San Angelo, District 7
Service: 32 years



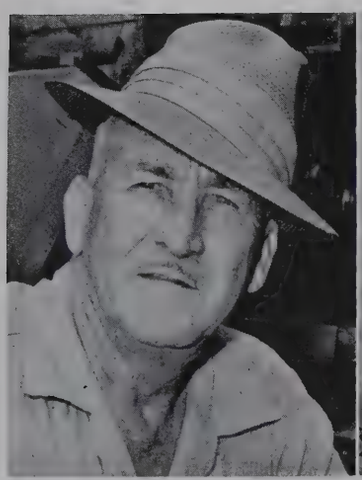
Oscar B. (Bill) Seabourn
Senior Equipment Supervisor
Abilene, District 8
Service: 27 years



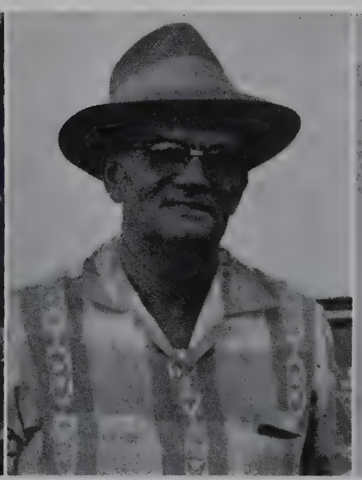
Edwin D. Davis
Senior Equipment Supervisor
Waco, District 9
Service: 30 years



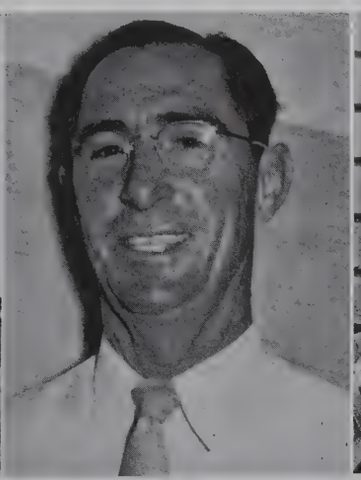
Thomas A. McBride
Senior Maintenance Superintendent
Tyler, District 10
Service: 38 years



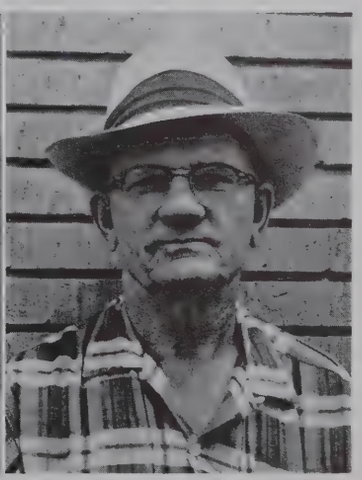
Lonnie H. Hubbert
Senior Equipment Supervisor
Lufkin, District 11
Service: 32 years



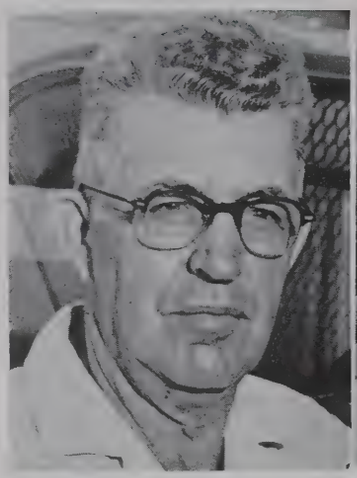
William W. Hunter
Senior Equipment Supervisor
Houston, District 12
Service: 23 years



Anton W. Valigura
Senior Equipment Supervisor
Yoakum, District 13
Service: 14 years

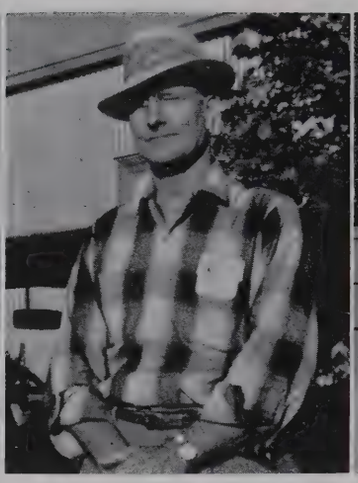


Jerome K. (Kearby) Nash
Senior Equipment Supervisor
Austin, District 14
Service: 17 years

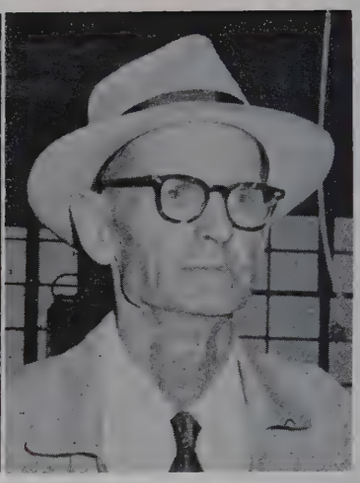


Richard C. Hughes
Senior Equipment Supervisor
San Antonio, District 15
Service: 28 years

Joe C. McMeans
Senior Equipment Supervisor
Corpus Christi, District 16
Service: 22 years



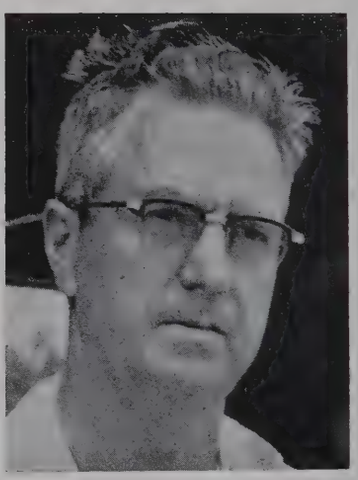
Russell L. Jones
Equipment Supervisor
Bryan, District 17
Service: 26 years



Melvin L. Smith
Senior Equipment Supervisor
Dallas, District 18
Service: 33 years

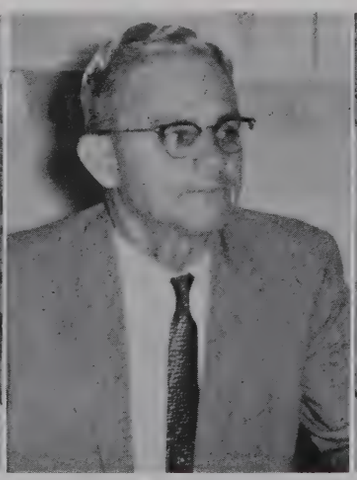
Jesse L. Ross
Senior Equipment Supervisor
Atlanta, District 19
Service: 25 years

Hugh D. (Bill) Hamm
Senior Equipment Supervisor
Beaumont, District 20
Service: 16 years

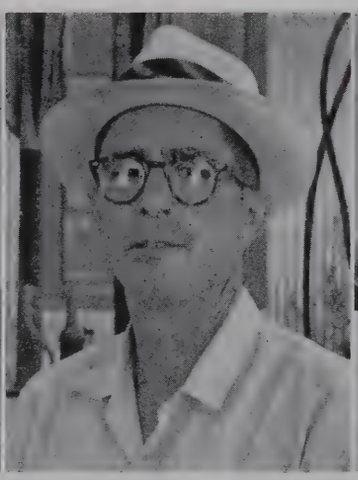


James E. Greenwalt
Equipment Supervisor
Pharr, District 21
Service: 6 years

George D. Fisher
Equipment Supervisor
Del Rio, District 22
Service: 26 years



Luke McHan
Senior Equipment Supervisor
Brownwood, District 23
Service: 29 years



Roy J. Greer
Senior Equipment Supervisor
El Paso, District 24
Service: 18 years

Lewis H. Meinzer
Senior Equipment Supervisor
Childress, District 25
Service: 21 years

The Economics of

STEEL FABRICATION*

Edward J. Brown, Designing Engineer
Texas Highway Department
San Antonio, Texas

Did you know that during the past year, 1958, the Texas Highway Department contracted for nearly 123 million pounds of steel for highway structures? This figure includes only reinforcing steel which totaled nearly 83 million pounds, structural steel which totaled over 33 million pounds, and railing which totaled nearly 7 million pounds. At average unit prices of $.1094 for reinforcing, $.1391 for structural, and $.1933 for railing, this represents a total cost of nearly $15 million to the traveling public.

From these figures we can see that the use of steel in highway construction in our state is "Big Business" in itself. In 1958, our bill for steel represented approximately 5.7 per cent of the total cost. In 1957, this figure was even higher at 9.3 per cent. We must face our obligation as highway engineers to constantly seek means to reduce the cost of our highways. Since steel is a major item, it is a fertile field of attack against high costs. An examination of the use of steel for highway construction is then in order.

This discussion shall, however, be limited to the economics of steel fabrication for highway structures. Three main points will be investigated: economics of planning, economics of fabrication, and payment. Much of the following information was derived from replies to letters of inquiry sent to sixteen fabrication plants throughout the state. An effort has been made to combine all data received in such a way as to give a representative picture of the problems facing these firms.

Economics of Planning

Concerning the economics of planning, many interesting points have been brought out.

Anchor bolts of various sizes and combinations have caused some difficulty. It is generally believed that some type of standardization in the detailing of these anchor bolts would be beneficial and certainly more economical. There seems to be a great variation in size and type of anchor bolts used for rail-post anchors. At least one fabricator has found in his stock a large supply of variable lengths, sizes, and types of threaded bars—bars with bolts welded to ends, and bars with sleeves welded to ends for the M2 bars on CG and CGC pan designs. If any standardization were possible, such a stockpile could be composed, for the most part, of anchor bolts and bars readily available for use on nearly any project.

Problems concerning reinforcing steel details are minor. In fact, very few design drawings received by the fabricators have bars detailed as is done in our plans. Such detailing provides a good check for the fabricator. On the other hand, the dimensioning of bent bars from center to center is not in accordance with standard fabrication practice by which these bars are dimensioned out to out. One fabricator feels that compliance with the industry standard will make possible more accurate fabrication. In addition, the use of bars of 60-foot lengths below Number 6 does not seem to be practical. Bar bundles of this size and length are too flexible for ease of handling, and special shipping permits are usually required for such lengths. Finally, it has been suggested that, in the case of culvert extensions, errors and questions might be kept at a minimum if the extensions could be listed as upstream and downstream rather than right or left, especially where cutoff walls vary in depth.

Structural steel details have been found very satisfactory by most fabricators but some suggestions have been offered. Duplication seems to be the key to economy here. As an example, duplication of steel beam stringers, especially diaphragms as often as possible, is a tremendous aid to the fabricator and later to the contractor in the field. The fewer number of detail drawings necessary will reduce the possibility of errors in the shop drawings and later in the shop fabrication.

Among the suggestions concerning beam details, five bear some investigation from an economic standpoint. First, the elimination of vertical cuts on free end beams where square cutting is satisfactory. In the case of slight beam slopes at abutments, this could well be done. Second, on skewed bridges an end detail of the stringer would remove any question as to mill-order length of beams. Third, it has been suggested that a minimum of one-half-inch edge distance on cover plates for welding be maintained. It is believed that this will aid in both appearance and fabrication ease. Fourth, the necessity of marking areas not to be shop painted is questioned. More will be said of this later. Finally, the economy of the use of A373 steel for beams and cover plates is in doubt. In 1957, there

*Speech presented at the Thirty-third Annual Short Course.

existed a mill cost differential of about $6 per ton between A373 and A-7. One fabricator feels that the weldability difference between the two steels may not justify the increased cost.

With regard to the detailing of diaphragms, the tendency toward more uniformity of types used has been appreciated. However, it is generally felt that, if the cross-type diaphragms could be detailed, fabricated, and shipped in a knocked-down condition for field assembly, a considerable saving to the fabricator could be realized—especially for diaphragms on a horizontally curved bridge.

Bearing shoe design has presented very little difficulty since the standard-type shoes are being used to a greater extent and most fabricators have developed detail files on these. An interesting point to note, however, is that the fabrication cost of the cast shoe is becoming more competitive with that of the milled shoe.

In the design and detailing of bridge railing, duplication is again the keynote. Duplicated rail panels, as often as practical, relieve the shop detailer and also the fabricator. The use of standard-type railings, rather than the special types which have been developed, will certainly aid the economy. Since the fabricator will normally obtain only a partial set of plans and seldom the slab details, it has been suggested that a curb or overhang section be included on the bridge layout sheet to eliminate the confusion of choice of rail-post anchorage conditions.

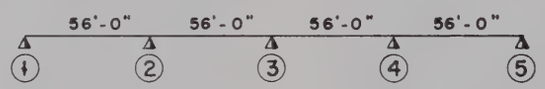
Some concern has developed with regard to the great number of special provisions now applying to general specifications. As the number increases, it seems probable that the fabricator will find himself in trouble if he fails to obtain and keep a complete file of these. The question has therefore been raised as to the possibility of a new edition of the specifications, or at least that part concerned with steel fabrication.

Finally, there is a need for a more careful checking of plan details. When an error is found, the fabricator must back check with the Bridge Division before proceeding with fabrication. We can readily see how this problem could delay steel delivery.

COST COMPARISON OF PLAIN OVERSIZE BEAMS AND COVER PLATED BEAMS

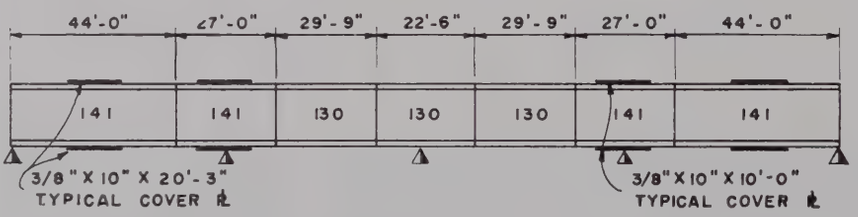
I.H.-10 OVERCROSSING @ FULTON AVE. - SAN ANTONIO EXPRESSWAYS

CONTINUOUS I-BEAM UNIT (7 BEAMS)



DESIGN #1 = 36 WF 150 (ALL SPANS) & NO COVER PLATES. OVER DESIGN IN SPAN ②-③ AND FOR MOMENT AT SUPPORT ③

DESIGN #2 = 33 WF 141 & 33 WF 130 AS SHOWN:



WGT. DESIGN #1 (7 BMS.) = 235,200 LBS.
WGT. DESIGN #2 (7 BMS.) = 225,188 LBS.
WGT. DIFF. = 10,012 LBS. = 4.3%

MATERIAL COST DIFFERENCE:
10,012 LBS. AT $6.15/CWT = $615.74
+ SIZE EXTRA AT .45/CWT = 45.05
TOTAL $660.79

LABOR COST DIFFERENCE (COVER PLATES):
CUTTING = 121' X 7 X $.25 = $211.75
WELDING = 121' X 2 X 7 X $.40 = 677.60
HANDLING: COVER PL = 10,842 X $.002 = 21.68
BEAMS WITH COVER PL = 150,568 X $.004 = 602.27
TOTAL $1513.30

TOTAL SAVING BY USE OF DESIGN #1 = $852.51

FIGURE - 2

Economics of Fabrication

To begin the discussion of the economics of fabrication, it seems wise to check some of the basic unit costs of fabricators in our area. Figure 1 indicates the average shop labor costs in Texas compiled from costs given by the various fabricators.

Average Shop Labor Costs in Texas

A. Welding at 40c/ft.
B. Cutting at 25c/ft.
C. Cleaning & Painting at 50c/cwt.
D. Beam Handling at 20c/cwt. per handling
   (1) Cutting
   (2) Welding
   (3) Layout of Bridge
   (4) Painting
   (5) Straightening
   (6) Loading
E. Drilling, Tapping at 20c per hole
F. Punching at 7c per hole
G. Riveting at 35c each

FIGURE 1

To illustrate the relative importance of these, an actual beam-design case is shown in Figure 2.

This illustration shows that in spite

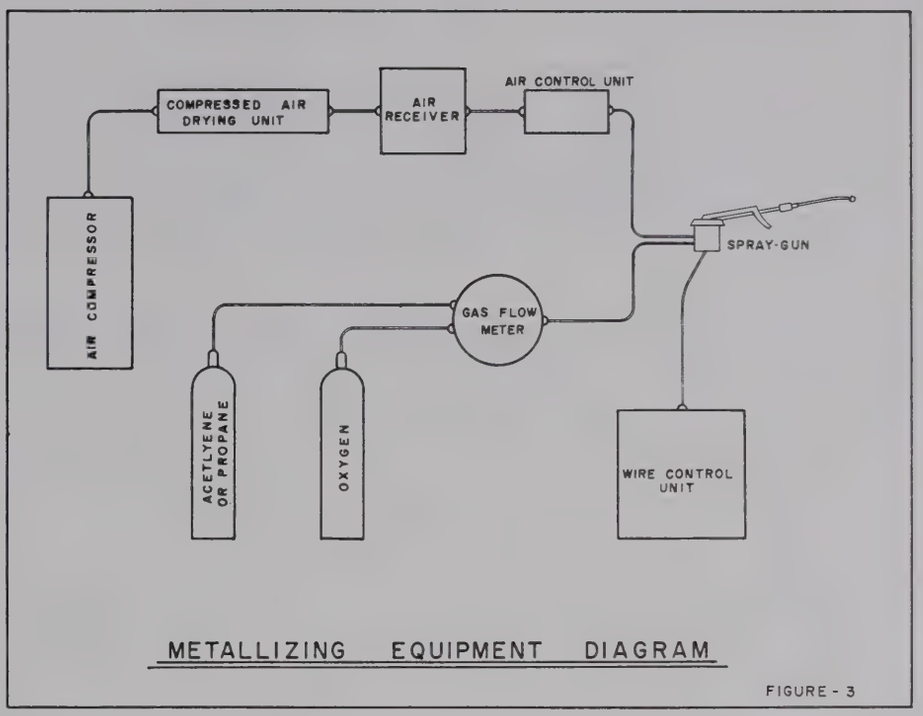
of a 4.3 per cent weight saving by the use of design number two, there is a considerable saving dollarwise by use of design number one.

As in the case of the design and detailing of reinforcing steel, there have been few problems in its fabrication. As most of us know, reinforcing bars are normally supplied to the fabricator in lengths of 40 and 60 feet. The fabricator naturally desires to supply the consumer with stock lengths as often as possible, but in the case of standard culvert construction in the MC series, this has sometimes not been allowed. In this instance, using the standard box length of 44 feet as an example, the longitudinal bars are listed in half lengths as 23 feet 2 inches. The fabricator can reduce by one-half the number of bars to be cut by furnishing one 40-foot stock bar and one short bar of 6 feet plus to provide the necessary length. By staggering the splices, such fabrication should be satisfactory.

With regard to the fabrication of structural steel, the most serious complaint has been concerned with the shop-coat painting. One fabricator earnestly opposes the practice of omitting paint from areas to be welded. He had this to say, "The practice of requiring the paint to be omitted from these surfaces which are to be welded is extremely expensive both in the engineering department and in the shops, approaching, under some conditions, a cost comparable to the cost of the rest of the detailing or even fabrication."

Plate girder fabrication requirements may stand some revision. It has been recommended that fitted stiffeners be used only where they are designed to bear. Where stiffeners are not designed to bear they could be cut back and painted on the ends.

In the case of riveted joints, it has become standard shop practice to supplement the use of fit-up bolts with tack welds. This permits the fabricator to position the joint rigidly and allows reaming the entire joint with all fit-up bolts removed. Some inspectors have not allowed such tack welds even though they seem necessary and efficient.



METALLIZING EQUIPMENT DIAGRAM

FIGURE - 3

Special Provision Number 21 to Item 406, "Steel Structures," which becomes effective this month, however, does allow the use of tack welds for the assembly of field splices to be drilled full size. For shop splices, tack welds are not permissible.

The fabrication of steel railing has not created too much difficulty although once again duplication plays a great part in the economy. By using such standard railing as the Type 11, rail posts can be mass produced and channels can be cut and punched at small cost. Picket-type and elliptical pipe-type railings on the other hand are much more difficult and costly to fabricate. Picket railing must be straightened after welding due to the small sizes and shapes which are used. For the PR-1 railing, the channels must be punched for insertion of the square pickets on six-inch centers. Elliptical pipe is sometimes not easily obtainable, and bending of such pipe is very costly.

A process which at times had found its way into the field of highway structure fabrication has put many Texas fabricators at a disadvantage. The process, known at metallizing, involves the spraying of very fine molten metal particles onto a clean, dry, metal surface. The method by which this is accomplished is quite complex and the equipment necessary is illustrated in Figure 3.

The diagram indicates that three separate systems are necessary: the air-flow system, the gas-flow system, and the wire-flow system. The wire, usually aluminum or zinc, flows through an oxygen-gas flame, where it melts, is atomized by a high-velocity flame, and projected through the gun onto the metal surface. This process is used, for the most part, along coastal regions where structures are exposed to salt-air damage. Most of our local highway fabricators do not possess the necessary equipment for this process, so they must in turn have the work done on a subcontract—which naturally increases the cost. The process itself is very tedious since it requires very careful control of air, gas, and wire-flow ratios. Too much oxygen gives excess oxides which have poor physical qualities. Too much acetylene slows the spraying speed and yields poor atomization. Nonuniform wire-flow rate will produce nonuniform coatings. Each pass by the operator yields only two to three mils (.002 inch to .003 inch) in thickness. Surfaces must be sandblasted before metallizing. Even fingerprints can de-

METALLIZING

1954 COSTS (DO NOT INCLUDE TRANSPORTATION OF EQUIPMENT AND PERSONNEL, CAPITAL INVESTMENT, MAINTENANCE OF EQUIPMENT, SCAFFOLDING (FIELD APPLICATION), BLAST CLEANING, PAINTING, OR CLEAN-UP WORK, SUPERVISORY COSTS, PROFIT).

METAL SPRAYING DATA *

ITEM	WIRE SIZE INCHES	CONSUMPTION PER HOUR			SPEED SQ. FT. COVERED PER HOUR .005" THICK	TOTAL COST PER HOUR	COST DOLLARS	
		LBS. METAL	CU. FT. OXYGEN	CU. FT. ACETYLENE			COST PER POUND SPRAYED	COST PER SQ. FT. .005" THICK
ALUMINUM	3/16"	17.6	80	39	250.5	11.12	.63	.045
ALUMINUM	1/8"	10.7	78	38	157.4	8.41	.79	055
ZINC	3/16"	61.0	84	41	247.0	27.68	.45	.110
ZINC	1/8"	40.7	.81	40	160.0	19.77	.49	.125

*USING WIRE FED GUN & ACETYLENE GAS AND BASED ON 100% CAPACITY WITH NO LOST TIME.

OTHER BASIC COSTS:

ALUMINUM 3/16" = $ .40 / LB.
ALUMINUM 1/8" = $ .41 / LB.
ZINC 3/16" & 1/8" = $ .39 / LB.
OXYGEN = $ 1.20 / 100 CU. FT.
ACETYLENE = $ 2.75 / 100 CU. FT.
AIR = $ .20 / PER HOUR

FIGURE - 4

stroy the bond. These are only some of the disadvantages of the process. The cost is shown in Figure 4.

Most firms are of the opinion that results obtainable by metallizing are no better than a properly applied coat of our standard shop paint. In either case, damage to the coating during shipment must be corrected in the field and it would seem that such repairs would be more economical by use of paint than by metallizing.

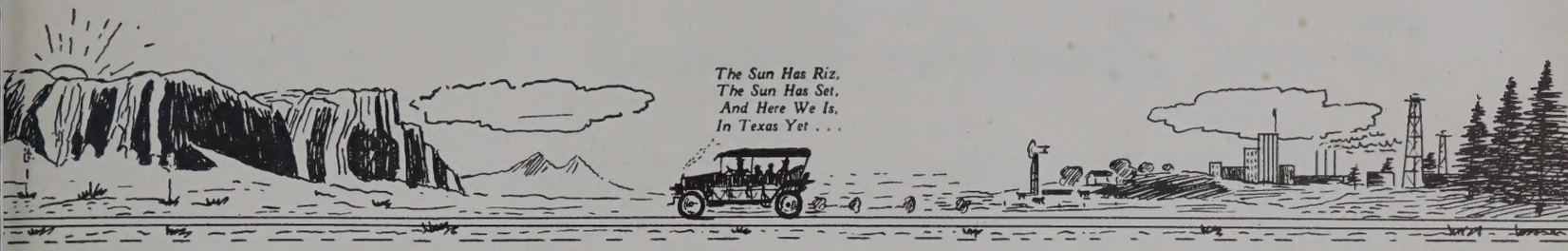
Payment

The method of payment on the net weight of steel basis may be due some investigation as to economy. Under the current specifications of the American Institute of Steel Construction, all payments are made on a gross weight basis. In almost every transaction, with the exception of our State Highway Department, payment is in accordance with this specification. Calculations made by the A.I.S.C. system are simple to the point that a semiskilled draftsman or clerk can perform them. Conversely, under our present highway specification, the calculations necessary for the deduction of copes, cuts, and holes, require more highly skilled personnel—which results in higher costs. In the end it is questionable whether there is any saving by use of our specification, since it is generally known that unit prices quoted by the fabricator are based on gross weights.

In conclusion, if we study these and other points or suggestions and keep them in mind we may foresee ways of reducing the cost of steel in our highway structures. For instance, if we could find a means to reduce our average unit price of steel by only one-half cent per pound, we would realize a net annual saving of over $600,000, or about 4½ per cent of our 1958 steel bill.

Steel costs to the fabricator have risen and will continue to rise as a result of contractual agreements between the labor unions and the mills during the past few years. Contract talks are scheduled to begin about May 18 of this year in New York City. It has been estimated, as a probable result of these negotiations, that the mill price of steel will increase about $4 per ton.

We must therefore attack this problem during the design and fabrication periods and strive for a better program of economics in the use of steel.



OVER THE HIGHWAYS

Comments . . . from the Traveling Public

This letter is for the purpose of bringing to your particular attention an employee working out of the Highway Department office or shops at Laredo. This is not as a complaint but rather as a commendation of Mr. Charles Alexander, District 21, Webb County highway Number 83, and his road crew.

On May 25 we were driving from our home in San Angelo, to Laredo, when I inadvertently let my car run out of gas about 40 miles out of Laredo. In flagging down another car it fortunately happened to be your Mr. Alexander. I explained what my trouble was and he immediately figured out a way to get us on our way to my passengers' ailing son, within less than 30 minutes. The whole crew were what we consider extra courteous and absolutely refused to accept any pay whatsoever, which we gladly offered.

We sincerely hope Mr. Alexander's immediate superior or Division Superintendent will be informed of this incident and of our appreciation for such courteous treatment, and that your office has so been informed.

R. W. Rogers
San Angelo, Texas

◈ *Charles Alexander is Senior Maintenance Foreman at Laredo.*

We have just completed a trip of over 2,000 miles on the finest roads in the U.S.A. They are well posted and the right of way clean.

I live in California. We have good roads, but in many ways yours are better. The slant curbs are fine, they prevent curb-burned tires.

We love your Texas, your people, and your roads.

J. M. Jones
Temple City, California

Would you please mail me your new 1959 Official Highway Travel Map as I return to Texas each year for a short rest and a good breath of smog-free air.

I have lived in California for the past five years, moving here from Amarillo, Texas, after the war, and I still miss the good Texas highways. Keep building them.

Glenn E. Allen
Costa Mesa, California

I have just completed a trip from —— to ——, and only had one narrow escape on the highway. I am sorry to report that this was caused by the utter stupidity of your repair crew.

On June 1, just east of ——, traveling east on highway ——, my daughter topped a hill making 60 mph and just before her was one of your flagmen with his flag hanging to his side. He was in the center of the highway and too close to the rise for us to see him until we about ran over him. After dodging this man, there were two highway trucks side by side and as the highway was narrow, there was no room for us to pass them except to go on the dirt. One of the trucks had its left door open and the driver was standing in the door. We slammed on our brakes, throwing our baby grandson into the dash and cutting his head. My wife, who is just getting over a broken back, was slammed forward and is still suffering with her back from the sudden stop. We turned onto the dirt to avoid hitting the open door and then we stopped. . . . The so-called flagman was not over 25 feet behind the two parked trucks. The 25 feet may have been safe for the flagman if there was not a rise in the road in front of him. . . .

Trusting that this letter will help to save the lives of some unsuspecting traveler in this district, I remain,

Signed

Last Wednesday, at about 9:30 a.m., a tire on our car went flat just east of Blossom. One of your highway crewmen came along and put our extra tire on for me, and I was on time at Cox Field to meet a nephew coming in for a funeral. Your man was courteous and pleasant and I surely did appreciate his help.

Mrs. C. R. Dinwiddie
Clarksville, Texas

To and From Our Readers

Dear Editor:

Shame on you—about the cover on the June 1959 issue of TEXAS HIGHWAYS. Don't you know that Interstate 35 intersects Interstate 20 in Fort Worth at a giant multimillion dollar mixmaster interchange? We had flattered ourselves on its being a landmark in the minds of motorists everywhere, certainly within the Texas Highway Department. Now TEXAS HIGHWAYS comes along and misnames it, which is perfectly understandable. But the beautiful cover scene, which is just another of many beautiful highway scenes Fort Worth is so proud of, can best be described as: "Looking south along South University Drive in Fort Worth, Interstate 20 (West Freeway, U.S. 80, State Highway 550) foreground."

Charles G. Cotten, Manager
Highway and Territory
Relations Departments
Fort Worth Chamber
of Commerce

In regard to your cover picture on the June issue of TEXAS HIGHWAYS, I think you have made a mistake about the location of the picture.

It is a picture of the East-West Freeway (State 550) and its junction with University Drive. This is just south of the Botanic Gardens and north of the Forest Park Zoo.

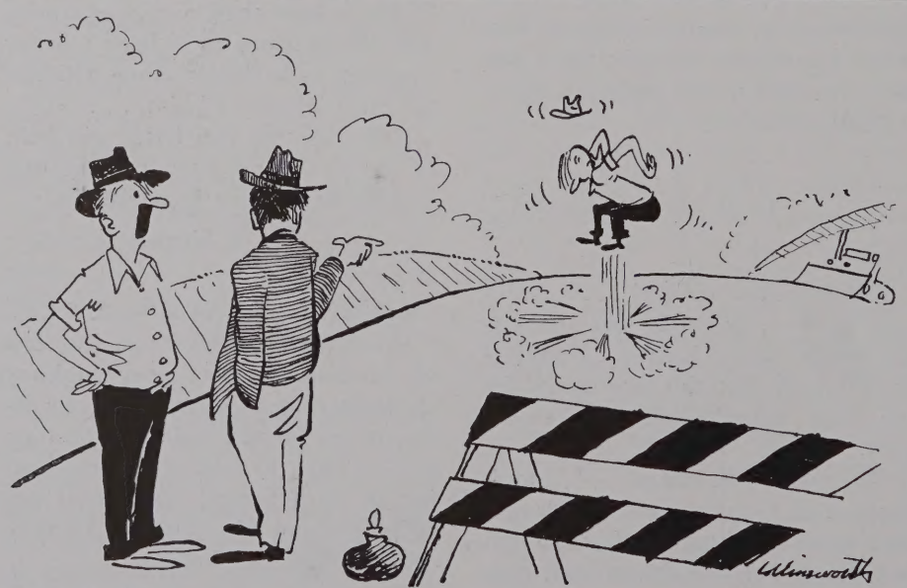
Let me know if I am wrong. Enjoyed your last copy very much.

Kenneth Reese
Semi-skilled Laborer
District 23

◈ *These gentlemen are so right. The cover picture for June should have been identified as University Drive, crossed by Interstate 20. We are glad to learn that at least two of our readers caught this mistake.*

Enjoyed your tribute to Ken Collinsworth in the June issue of TEXAS HIGHWAYS. Quite an improvement over page 14 of the May issue. I have been one of Ken's fans for many years and hope he keeps up the good work.

Oscar Crain
District Engineer
District 5



"IT'S OUR LABORATORY ENGINEER..... HE'S RUNNING A COMPACTION TEST."

About Our Pictures . . .

This construction shot on the cover of the south approach to the Corpus Christi high bridge was taken in February. Today, the project is complete except for minor finishing up. U. S. 181, the approach, crosses State Highway 9, and at the top of the picture is the beginning of the high-level bridge. At right is a pedestrian walkway leading to the Nueces County Courthouse, the large building directly behind the spiral walkway.

Pictured inside the front cover is the north approach to the Corpus high bridge. On page 2 of this issue is a story on the bridge—largest project ever undertaken by the Department.

Used with the title of the Corpus Christi high-level bridge story — "Skyway," on page 2—is a picture of a watercolor by Highway Department employee Griffith Gates. Gates is employed in Planning Survey Division.

TEXAS HIGHWAY COMMISSION

HERBERT C. PETRY JR.	Chairman
CHARLES F. HAWN	Member
HAL WOODWARD	Member
D. C. GREER	State Highway Engineer

Texas Highways

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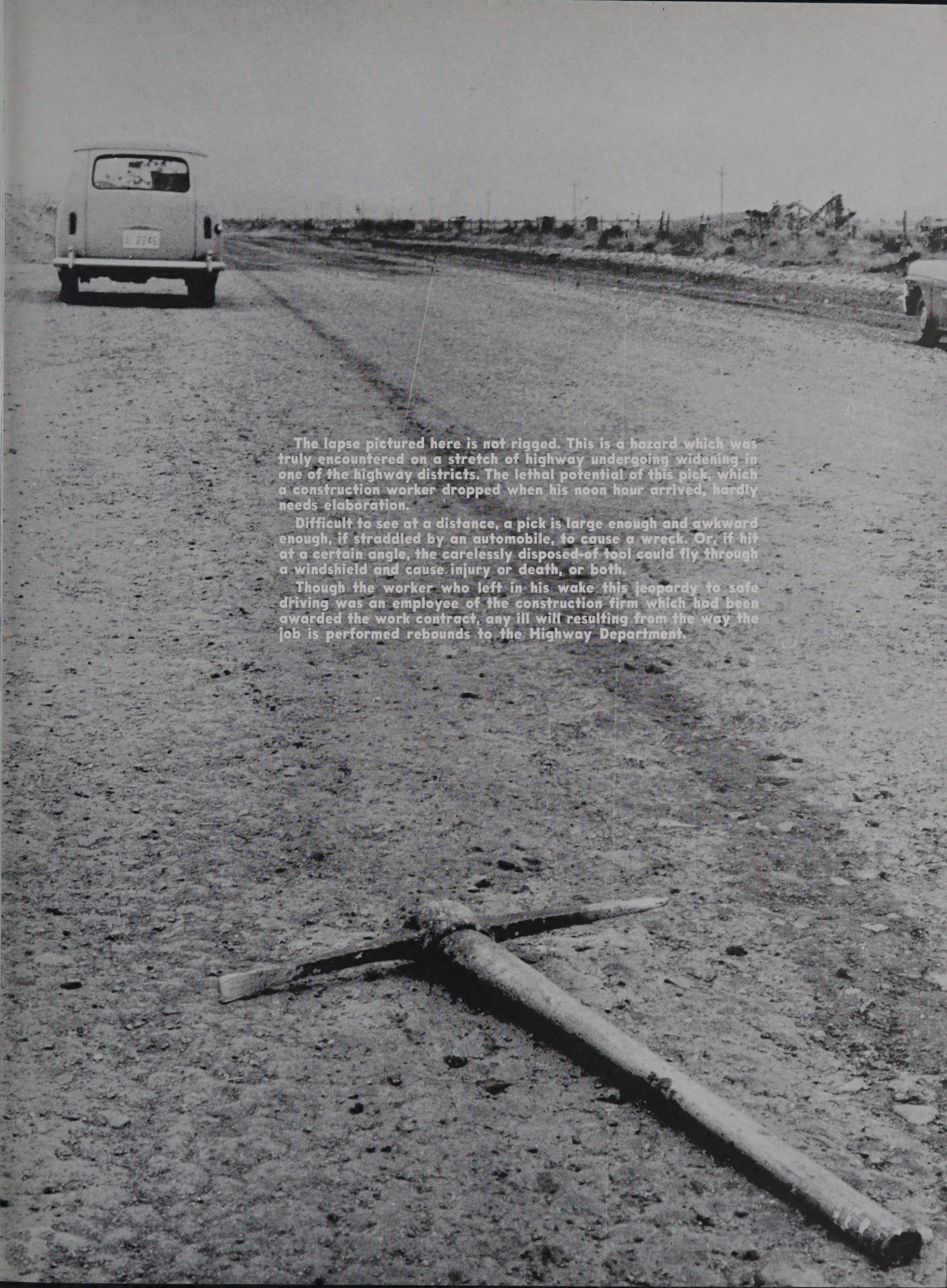

The lapse pictured here is not rigged. This is a hazard which was truly encountered on a stretch of highway undergoing widening in one of the highway districts. The lethal potential of this pick, which a construction worker dropped when his noon hour arrived, hardly needs elaboration.

Difficult to see at a distance, a pick is large enough and awkward enough, if straddled by an automobile, to cause a wreck. Or, if hit at a certain angle, the carelessly disposed-of tool could fly through a windshield and cause injury or death, or both.

Though the worker who left in his wake this jeopardy to safe driving was an employee of the construction firm which had been awarded the work contract, any ill will resulting from the way the job is performed rebounds to the Highway Department.